a first polarization maintaining (PM) coupler for splitting signals received from an optical source into first and second optical paths;

a phase modulator disposed in the first optical path;

a piezo-electric transducer (PZT) disposed in the second optical path;

a second PM coupler for recombining outputs of the phase modulator and the PZT;

a photodetector for detecting signals sampled from the second PM coupler; and

a phase locked loop (PLL) for providing feedback to the PZT to control relative phases of the first and second optical paths.

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1-23 are present in this case. In the instant response, Claims 1, 11, 20 are amended and new Claims 22 and 23 are added.

In the outstanding Office Action, Claims 1-5, 9-15, and 17-21 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,675,648 to Townsend; and Claims 6-8 and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over Townsend in view of U.S. Patent No. 5,193,128 to Farina et al.

Applicants traverse the rejection of Claims 1-5, 9-15, and 17-21 rejected under 35 U.S.C. §103(a) as being unpatentable over Townsend.

Claim 1 of the present invention recites a fiber optic modulator system comprising, among other features, a phase modulator disposed in a first optical path, a

piezo-elèctric transducer (PZT) disposed in a second optical path, a second PM coupler for recombining the first and second optical paths, and a detector for detecting the output from the second PM coupler. The detector 48 for detecting the output from the second PM coupler is thus a part of the fiber optical modulator system. See Figure 5 of the present specification.

Townsend discloses a system and method for key distribution using quantum cryptography. Townsend's Figure 4 discloses a communication system having a transmitter 1, a receiver 2, and a transmission medium 3 linking the transmitter to the receiver. The transmitter 1 includes a laser 48, and a modulator driver 49.,and the receiver 2 includes a phase modulator 42, a modulator driver 52, and detectors 43, 44. See Townsend's col. 4, lines 35-48. Optical signals from the laser 48 are modulated with encrypted data and then forwarded as output onto the transmission fiber 3, and subsequently detected at the receiver 2. See Townsend's col. 3, lines 10-15. Thus, one would logically conclude that transmitter 1 modulates the optical signal that is subsequently detected by the receiver 2. Receiver 2 thus appears to be a demodulator for demodulating the signal received from transmitter 1 via transmission fiber 3.

A

Townsend does not describe a phase modulator in any of the optical paths of the first FC

Section 2 of the Office Action asserts Figure 4 of Townsend as teaching a fiber optic modulator system having a first fiber coupler (FC) for splitting a signal received from an optical source 48 into two optical paths. According to this observation made by the Examiner, transmitter 1 includes a semiconductor laser 48 whose output is received in the first FC. One path (first path) of the first FC includes an element 55

while the other path (second path) of the first FC remains open and thus not shown to be connected to any other element. The rejection therefore fails to recognize that unlike the invention in the Townsend reference there is absent the phase modulator 41 in any of the optical paths of this first FC.

Townsend's polarization compensator is disposed in the receiver not in the transmitter

Townsend's first FC (having element 55) appears to be connected to a second FC having phase modulator 41 in one of the optical paths, while the other optical path of the second FC has no other optical elements therein. Unlike the invention, there is no PZT in the other optical path of this second FC. After passing through a third FC, modulated signals are transmitted via transmission fiber 3 to the receiver 2. The Office Action, however, asserts Townsend as disclosing the PZT disposed in a second optical path and refers to Townsend's polarization compensator (PC) 10. Applicants respectfully note that Townsend's polarization compensator 10 is disposed within the receiver 2 and not in the transmitter 1. Furthermore, the PC 10 is not connected in a second optical path of the FC having phase modulator in one of its optical paths.

Thus, Townsend fails to teach or suggest a phase modulator having a first PM coupler having a phase modulator disposed in a first optical path while a PZT is disposed in a second optical path. Since Townsend fails to teach or suggest a PM coupler for splitting a signal received from an optical source and having a phase modulator in one optical path while having a PZT in the other path, it teaches away from the claimed invention.

The two optical paths, with the phase modulator and the PZT in respective optical paths, form a Mach-Zender cavity, and these two optical paths are combined in a second PM coupler. Townsend fails to even remotely suggest a structure as recited in the claimed invention.

Townsend does not have a photodetector in the modulator/transmitter

In addition to the above, claim 1 of the present invention specifically recites "a detector for detecting the output from the second PM coupler." Townsend fails to teach or suggest having a detector in the modulator. The avalanche photodiodes (APD) 43/44 noted by the Examiner reside in the receiver 2 and not in the transmitter 1. Since the detector for detecting the output of the second PM coupler does not reside in the modulator as required by the claimed invention, Townsend further teaches away from the claimed invention.

Accordingly, Applicants respectfully submit that claim 1 and the claims depending therefrom are in condition for allowance. For example, claim 2 depends from claim 1 and further limits the scope of claim 1. Claim 2 further recites a fiber tap for sampling output from the second PM coupler, a d.c. photodetector for detecting the output of the fiber tap, and a phase locked loop (PLL) system disposed to receive a signal from the d.c. photodetector, the PLL system providing a feedback signal to the PZT for controlling the relative phases of the first and second optical paths.

The Office Action refers to the receiver section of Figure 4 of Townsend as teaching the claimed structure. It specifically asserts that "a feedback loop from photodiode APD to PC/PZT" as teaching this feature. Applicants respectfully disagree. Unlike the invention, there is no feedback loop from APDs 43/44 to the PC

10 in Townsend's Figure 4. Townsend's feedback loop connects the PC 10 to the microprocessor 54. Furthermore, Applicants respectfully note that this structure that the Examiner is referring to is in the receiver and is being used for detecting the modulated signal that is sent via the transmission medium 3. Such a structure is not a part of the modulator.

Figure 5 of the present specification clearly identifies the fiber tap as the coupler 58 as sampling the output of the second PM coupler 56, and the output of the fiber tap is detected by a d.c. photodetector 50. Since Townsend's modulator fails to teach or suggest a fiber tap, a d.c. photodetector, the question of sampling output of the second coupler and using a phase locked loop (PLL) for feeding back the signal to the PZT for controlling phases of the first and second optical paths of the first PM coupler does not even arise. Accordingly, claim 2 is also in condition for allowance.

Applicants' remarks made with respect to claim 1 are equally applicable to independent claims 11 and 20. Accordingly, claims 11, 20 and their respective dependent claims are also in condition for allowance.

Claims 6-8, and 16 were rejected under 35 U.S.C. §103(a) as being unpatentable over a combination of Townsend and Farina. Farina relates to an integrated optic modulator with smooth electro-optic bandpass characteristics. Claims 6-8 depend from independent claim 1, and therefore further limit such claims in a patentable sense. Neither Townsend or Farina, independent or in combination, teach or suggest all the limitations of Claim 1. Accordingly, claims 6-8 which depend from claim 1 are also in condition for allowance. Claim 16 depends from claim 1, and for

similar reasons stated with respect to claims 6-8, claim 16 is also in condition for allowance.

Consequently, in light of the above discussion and in view of the present amendment, the present application is believed to be in condition for allowance and an early and favorable action to that effect is respectfully requested. While it is believed that the instant amendment places the application in condition for allowance, should the Examiner have any further comments or suggestions, it is requested that the Examiner contact Applicants' attorney, George Legg, at the undersigned at 202-404-1559.

Kindly charge any additional fee, or credit overpayments, to Deposit Account No. 50-0281.

Respectfully submitted,

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MARKED-UP COPY OF AMENDED CLAIMS

Please amend claims 1, 11, and 20 as shown below:

1. (Amended) A fiber optic modulator system, comprising:

an optical source;

a first polarization maintaining (PM) coupler for splitting a signal received from said source into two optical paths, said two paths forming a Mach Zender Modulator (MZM);

a phase modulator disposed in a first optical path of the first PM coupler;

a piezo-electric transducer (PZT) disposed in a second optical path of the first PM coupler;

a second PM coupler for recombining said first and second optical paths; and

a detector for detecting the output from said second PM coupler.

11. (Amended) In a fiber optic communication system having at least one fiber optic modulator, a method of enhancing the performance of the communication system comprising: [fiber optic links comprising the steps of:]

providing an optical source;

splitting signals from said optical source into first and second paths, said first and second paths forming a Mach-Zender Modulator (MZM) cavity;

phase modulating the signals in said first optical path;

controlling optical path length of said first and second paths;

combining the signals in said first and second paths; and

detecting the combined signals.

20. (Amended) A fiber optic link system for transmitting signals from a source to a destination having a fiber optic modulator, the fiber optic modulator comprising:

an optical source;

a first polarization maintaining (PM) coupler for splitting a signal received from said source into two optical paths, said two optical paths forming a Mach Zender Modulator (MZM);

a phase modulator disposed in a first optical path of the first PM coupler;

a piezo-electric transducer (PZT) disposed in a second optical path of the first PM coupler;

a second PM coupler for recombining said first and second paths; and

a detector for detecting the output of said second coupler.

22-23. (New)